

6.0 ELECTRIC TRANSMISSION

The Henrietta Peaker Project (HPP) will connect to the 70-kilovolt (kV) Henrietta Substation bus via a new transmission line, designated as the HPP Generator Tie-line, which will be owned by Pacific Gas and Electric Company (PG&E). The HPP parcel and the PG&E Henrietta Substation parcel are directly adjoining parcels. The 70-kV HPP Generator Tie-line will leave the HPP switchyard, run north for approximately 400 feet, and turn east for approximately 150 feet to connect with the existing PG&E-owned 70-kV Henrietta Substation bus. Therefore, the HPP Generator Tie-line does not cross any property other than the GWF HPP parcel or the PG&E Henrietta Substation parcel.

The proposed transmission interconnection will be an approximately 550-foot-long, single-circuit, 70-kV line. The proposed transmission route is shown on Figure 6-1. A photo-simulation of the transmission line is provided in Section 8.11 (Visual Quality).

6.1 Transmission Line Engineering

6.1.1 Existing Facilities

The existing transmission facilities in the area of the HPP were evaluated to identify transmission lines and substations with adequate capacity to accommodate the output of the proposed plant. These facilities include:

- PG&E's Henrietta Substation is located directly adjacent to the northern boundary of the HPP site. This switchyard is connected to PG&E's 70-kV, 115-kV, and 230-kV transmission systems. This substation will be the termination point for the 70-kV HPP Generator Tie-line. Several other transmission lines enter the Henrietta Substation (see Figure 6-1).
- PG&E's 115-kV Henrietta-Kingsburg transmission line parallels 25th Avenue and enters the Henrietta Substation from the west. This line is a single-circuit line utilizing wood poles. The poles are shared with the 70-kV Henrietta-Tulare line described below.
- PG&E's 70-kV Henrietta-Tulare Lake transmission line parallels 25th Avenue and enters the Henrietta Substation from the west. This line is a single-circuit line utilizing wood poles.

6.1.2 Transmission Facilities for HPP

6.1.2.1 Henrietta Peaker Project Switchyard

The 70-kV HPP switchyard will be located on the north side of the HPP site. The switchyard will use a two-breaker radial bus configuration. The two breaker positions will be for the two combustion turbine generators (one position for each unit). The HPP switchyard will be designed in accordance with applicable industry standards and will have the following ratings:

- Nominal-voltage – 70-kV
- Basic impulse level – 350-kV
- Continuous current – 2,000 amperes
- Short circuit current – 40,000 amperes

The switchyard will use a conventional outdoor-air-insulated rigid-bus design supported on galvanized steel structures. The switchyard will be enclosed with a galvanized steel, chain-link fence of typical height. All nongalvanized structures and equipment will be painted shades of ANSI gray. The control building will be a color similar to that of the adjacent HPP power generation facility.

A ground mat will be installed to provide safe step-and-touch potentials for the general public and switchyard operation and maintenance personnel. The grounding system will be designed in accordance with American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) Standard 80.

The switchyard alternating current (AC) supply will be derived from a redundant 480-volt AC feed from the HPP. The direct current (DC) supply for the control and protection systems of the HPP for the station will be derived from a 125-volt DC station battery. A one-line diagram for the HPP switchyard is shown on Figure 6-2. The configuration of the HPP switchyard is shown on Figure 6-2. Photo-simulations of the proposed switchyard are provided in Section 8.11 (Visual Resources).

6.1.2.2 Henrietta Peaker Project 70-kV Transmission Line

The proposed 70-kV HPP Generator Tie-line will be a single-circuit line constructed on two 55-foot-tall wood poles. Figure 6-1 shows the route of the proposed line. The route exits the HPP switchyard to the north and east, entering the Henrietta Substation and connecting with the Henrietta Substation 70-kV bus. The transmission line interconnect is approximately 550 feet in length and is entirely located on the HPP site or the PG&E site.

The proposed transmission line will require two wood poles, as shown on Figure 6-3. The ruling spans are expected to be approximately 225 feet. The selected pole heights will provide a minimum ground clearance of 30 feet at 60 degrees Fahrenheit (°F) and 28.5 feet at 130 °F, in accordance with the requirements of California Public Utilities Commission (CPUC) General Order No. 95 (GO-95).

The proposed line will use a single 954-kilo circular mills (kcmil) aluminum conductor steel-reinforced (ACSR) “Cardinal” per phase. This conductor has a normal current rating of 995 amperes. The normal conductor rating was determined from Alcoa’s *T&D Conductors, Overhead Underground* handbook, based on a maximum conductor temperature rise of 40 degrees Celsius (°C) above a 40 °C ambient temperature, a 2-foot-per-second (fps) crosswind, and an emissivity factor of 0.50 without sun. The conductor has an emergency rating of 1,248 amperes. The emergency rating was determined from the *Aluminum Electrical Conductor Handbook*, assuming a maximum conductor temperature rise of 60 °C over a 40 °C ambient temperature, a 2 fps crosswind, and an emissivity factor of 0.50 without sun.

The proposed line will include one optical groundwire shield wire containing approximately 24 optical fibers. The fiber-optic groundwire will be used to provide communication paths for system protection and voice and data transmission, and shielding for lightning protection.

6.1.2.3 Other

Typical industry design, operation, or maintenance practices will be required for the proposed substation and transmission line facilities. Both substation sites and all

transmission structure locations will be accessible from existing dirt, gravel, or paved roads. An access plan will be prepared to designate acceptable construction access routes. Construction access routes will be flagged in the field as required.

Temporary disturbance of land during construction, maintenance, and operation is considered negligible because the construction laydown, access, and staging areas will be on PG&E property. The total permanent disturbance area is the approximate area of two wood poles.

The anticipated schedule for approval, materials and equipment procurement, and construction of the stations and transmission line is as follows:

- August 2001 – Submit AFC to the California Energy Commission (CEC)
- January 2002 – Start switchyard and transmission line construction
- March 2002 – Complete electrical interconnect construction

6.1.3 **Applicable Regulations**

The transmission line and switchyard associated with the HPP will be designed and constructed in conformance with CPUC GO-95 and the National Electrical Safety Code (NESC). A list of applicable laws, ordinances, regulations, and standards (LORS) that may apply to the transmission line and switchyard design are presented in the following sections.

Table 6-1 lists LORS applicable to the design and construction of the transmission line and switchyard. Table 6-2 lists the LORS that govern fire hazard protection for the HPP. Table 6-3 lists the LORS regarding hazardous shock protection for the HPP. Table 6-4 lists the applicable aviation safety LORS. Table 6-5 lists the applicable LORS regarding communications interference.

6.2 **Transmission Line Electrical Effects**

6.2.1 **Project Characteristics**

To integrate the HPP output into the PG&E 70-kV transmission system, GWF will construct a 550-foot, 70-kV transmission line between the HPP and PG&E's 70-kV

Henrietta Substation. The design criteria and assumptions used to complete the initial design of the project's transmission line and calculate its electromagnetic field (EMF), audible noise, and radio/television interference (RI/TVI) effects are described below.

6.2.1.1 Assumptions

The nominal transmission-voltage will be 70-kV. For these calculations, the transmission line loading was assumed to be a nominal 95.8 megawatts (MW). The line will be a single-circuit line composed of one 954-kcmil ACSR per phase carrying 791 amperes. A profile view of the transmission line is shown in Appendix A.

The EMF calculation for the HPP Generator Tie-line was complicated by the presence of the substation and the numerous other transmission lines entering the substation. The addition of the 70-kV HPP Generator Tie-line will have a minimal effect on the total EMF in the area and does not warrant further analysis.

The phase currents will be balanced (equal). The power factor used in the calculations will be 0.98 (leading or lagging). Continuous plant operation will not occur at this power factor, and variations in the actual power factor can be expected. This power factor represents a typical value for this area.

For the purposes of these calculations and to be conservative, the EMF, RI, TVI, and audible noise calculations were performed at an assumed minimum conductor height above ground of 26 feet (mid-span). However, from a design perspective, the conductors will be a minimum of 32 feet above the ground. The calculations were performed using the Bonneville Power Administration (BPA) Corona and Field Effects Program.

6.2.1.2 Conductor Analysis

The selection of a phase conductor size and type for a new transmission line typically considers a number of factors, including:

- **Thermal Capacity.** The conductor size/type selected must have a thermal capacity greater than the initial and future capacity requirements of the project.

- **Economics.** Economic evaluations typically consider the effects on conductor, structure, and foundation costs of various conductor sizes/types and bundle configurations (conductor diameters, sags, and tensions). The present worth of conductor losses is also typically considered.
- **Environmental.** Electric and magnetic field strengths are largely dependent on the maximum line operating-voltage, phase conductor currents, and the spatial arrangement (configuration) of the phase conductors, not the conductor size/type.
- **Standardization.** Industry standard/typical conductor sizes/types and bundle configurations are given preference because of operation and maintenance, and in-service reliability considerations.
- **Minimum Size.** A minimum allowable conductor size of 954 kcmil was selected for this project. This size selection was based on a combination of RI/TVI, corona, mechanical sag, and strength considerations and is applicable to nonbundled phase conductors only.

6.2.2 Aviation Safety

There is no major commercial aviation center in the general vicinity of the project; however, Naval Air Station (NAS) Lemoore runways are approximately 4.7 miles northwest of the HPP.

In accordance with Title 14 of the Code of Federal Regulations (CFR), Part 77, a Notice of Construction or Alteration must be filed with the Federal Aviation Administration (FAA) if any structure in the vicinity of the construction site rises 200 feet (500 feet in uncongested areas) above the average ground level. A notice is also required if any structure protrudes above an imaginary surface extending from the end of the nearest runway at a slope of 50:1 for 10,000 feet (if the longest runway length at the airport is 3,200 feet or less) or a slope of 100:1 for 20,000 feet (if the longest runway at the airport is longer than 3,200 feet).

The closest runway is over four miles from the HPP. No structures will rise 200 feet or more or penetrate the imaginary surface, as stipulated in Title 14 CFR Part 77. Therefore, an FAA Notice of Construction or Alteration is not required for the HPP.

6.2.3 Audible Noise and Radio/TV Interference

Audible noise is defined as any unwanted sound from a man-made source, such as a transmission line, a transformer, an airport, vehicular traffic, etc. Audible noise is superimposed on the background or ambient noise that existed prior to the introduction of the audible noise source.

When an electric transmission line is energized, an electric field is generated in the air around the conductors. This electric field may cause corona (the breakdown of the air in the vicinity of the transmission line phase conductors). When the intensity of the electric field at the conductor surface exceeds the breakdown strength of the surrounding air, a corona discharge occurs at the conductor surface. This corona discharge produces energy, which can result in audible noise and/or RI/TVI. The corona effects from the line were calculated using the BPA Corona and Field Effects Program.

Corona-generated audible noise can be characterized as a hissing, crackling sound, which, under certain conditions, can be heard. The noise levels generated by the line are very low, and most of the time the audible noise will not be detectable, except in an area directly beneath the line on a quiet day. The audible noise calculation results for the proposed line are shown on Figure 6-4.

Corona on transmission line conductors can also generate electromagnetic noise in the frequency bands used for radio and television signals. This phenomenon is generally referred to as RI and TVI. These terms are commonly applied to any disturbance within the radio frequency band. RI and TVI consist of two distinct types: gap-type noise and noise due to corona. Gap-type noise is the result of sparking or arcing between two pieces of hardware. This arcing occurs when hardware is loose (not tight-fitting), or at sharp burrs or edges on the hardware. This type of noise occurs at discrete points along the line and is often associated with undermaintained lines. Such interference can be easily identified and corrected with proper maintenance. The second type of noise is caused by corona on the conductors. This corona noise emanates from the entire length of conductor and is typically referred to as RI and TVI.

Corona-related interference with radio and television reception is typically associated with transmission line-voltages of 345-kV or greater, although it may occur at lower-voltages. It is a direct function of the signal strength of the received radio/television signal and the level of the noise present. The signal to noise ratio (S/N) is defined as the ratio of the average signal power to the average noise power. The higher the S/N ratio, the better the reception quality. A high S/N ratio indicates a high signal level and a low noise level. Consider the analogy of a person talking in a room with low background noise and a person talking in a room with high background noise. If the person's voice (signal level) remains constant, the person will be heard much more easily in a room with low background noise than the person in a room with high background noise. This concept also applies to radio and television signals in the presence of background noise.

It is difficult to determine whether a particular level of RI or TVI will cause unacceptable radio or television reception. Studies have been conducted, however, to determine acceptable S/N ratios. For radio reception, a S/N ratio above 20 is generally considered to provide acceptable reception. For television reception, an S/N ratio of 30 to 40 typically provides acceptable reception. It is anticipated that for receivers proximate to the proposed line right-of-way, there will be little, if any, degradation of radio or television reception. The exception, if there is one, will be for very remote, poorly received stations. In addition, RI typically interferes with amplitude modulated (AM) stations only. Frequency modulated (FM) stations are generally immune to RI because of the inherent characteristics of the modulation scheme. Therefore, the probability of RI complaints is reduced, as a major band of the radio broadcast spectrum is generally unaffected by the phenomenon. The calculated RI and TVI for the proposed HPP Generator Tie-line are shown on Figures 6-5 and 6-6, respectively. These levels of interference are not expected to be noticeable, except for remote stations. The TVI at the edge of the right-of-way will be noticeable only for weak (remote) stations.

The proposed line will be maintained as part of a regular maintenance program. Therefore, it is unlikely any gap-type noise will result. If any is reported or discovered, it will be quickly mitigated. In addition, it is anticipated that few if any RI/TVI complaints will occur, because of the low magnitude of calculated corona noise. If complaints do occur, they will be addressed, investigated, and mitigated if needed, on a case-by-case basis.

6.2.4 Electric and Magnetic Fields

Electricity is a phenomenon resulting from the existence and interaction of charges. When a charge is stationary or static, it produces forces on objects in regions where it is present. When a charge is in motion, it produces magnetic effects. Whenever electricity is used or transmitted, electric and magnetic fields are created. Transmission lines, distribution lines, house wiring, and appliances produce electric fields in their vicinity due to the associated electric charges. Electric field strengths are typically expressed in units of-volts per meter or kilovolts (thousands of-volts) per meter (kV/m).

Electric charges in motion (currents) produce magnetic fields. The strength of a magnetic field is proportional to the current through the conductor (circuit) producing the field. Magnetic fields can be characterized by the force they exert on a moving charge or on an electric current. Electric currents are sources of magnetic fields. Magnetic field strengths are measured in milligauss (mG).

An example of electric and magnetic fields in a home is a lamp plugged into an electrical outlet. If the lamp is turned off, an electric field exists in the vicinity of the cord of the lamp because of the-voltage on the cord. When the lamp is turned on, current flows through the cord and a magnetic field also exists around the cord because of the current flow.

The strength of an electric field depends on the potential (voltage) of the source of the field, and distance from that source to the point of measurement of the field strength. Electric fields decrease rapidly as the distance (r) from the source increases. If an energized conductor (source) is placed inside a grounded conducting enclosure, the electric field outside the enclosure will approach zero (limited by ambient electric field level), and the source is said to be shielded.

Transmission-line-related magnetic fields decrease at a rate of $1/r^2$ if currents are balanced and conductors are closely spaced. Magnetic fields associated with unbalanced phase currents decrease at a rate inversely proportional to the distance from the source (conductor), at a rate of $1/r$. Transmission lines typically are operated with balanced phase currents.

The electric field created by a high-voltage transmission line extends from the energized conductors to other nearby conducting objects such as the ground, structures, vegetation, buildings, vehicles, and people. The strength of the vertical component of the electric field at a height of 1 meter (3.28 feet) is frequently used to characterize electric fields under transmission lines.

The transmission line parameters that have the greatest effect on electric and magnetic field levels in the vicinity of a transmission line are maximum operating-voltage, line current, conductor height, and electrical phasing. The maximum ground-level electric and magnetic fields typically occur near the centerline of a line and at mid-span where the conductors are closest to the ground. For purposes of these estimates, the minimum mid-span conductor height is assumed to be 26 feet.

The electric and magnetic fields from the proposed transmission line were calculated using the BPA Corona and Field Effects Program. The strengths of the electric and magnetic fields were calculated for a sensor height of 1 meter above ground. Calculations were performed based on the minimum 26-foot ground clearance and extend to 200 feet on each side of the centerline. The calculated magnetic fields produced by the proposed line operating at peak loading conditions are shown on Figure 6-7.

Note that for maximum current flow, the magnetic fields at 20 feet (typical right-of-way for PG&E 70-kV transmission lines) from the HPP Generator Tie-line centerline will be approximately 46 mG (40 feet is the typical 70-kV right-of-way width). At 50 feet from the centerline, the magnetic field level decreases to less than 20 mG. For lower currents through the transmission line conductors experienced during typical loading conditions, the magnetic field levels will decrease in direct proportion to the reduction in current.

The proposed route of the HPP Generator Tie-line traverses a sparsely populated area of Kings County. The closest house to the proposed route is over a mile away. At this distance, the contribution of the magnetic field of the transmission line to the overall magnetic field level will not be measurable. The HPP Generator Tie-line will be located entirely on the HPP site or the existing PG&E Henrietta Substation; therefore, the EMF effects will be

negligible compared to the EMF from the existing transmission lines entering the Henrietta Substation, and the EMF from the substation itself.

The electric field levels produced by the proposed transmission line are shown on Figure 6-8. The electric field level 20 feet from the centerline of the transmission line is estimated to be 0.29 kV/m.

Given the concerns about human exposure to electric and magnetic fields and possible adverse health effects, several states have adopted standards limiting electric and magnetic field levels within or at the edge of transmission line rights-of-way (refer to Table 6-6). California is not one of these states. However, while California does not have regulatory requirements for transmission line magnetic fields, the calculated magnetic fields for the proposed transmission line (refer to Figures 6-7 and 6-8) are much lower than the requirements for those states with existing limitations.

California does not regulate the level of transmission line electric fields. However, calculated values for the proposed line (refer to Figure 6-8) are also substantially below the levels established by those states that do have limits.

6.2.4.1 Transmission Line Electromagnetic Field Reduction

While the State of California does not require any particular limit for electric and magnetic field levels, the CPUC mandates EMF reduction as a practicable design criterion for new and upgraded electrical facilities. From this mandate, the regulated electric utilities, including PG&E, have developed their own design guidelines to reduce EMF at each new facility. The CEC requires independent power producers to follow the guidelines that have already been established by the local electric utility or transmission-system owner.

In keeping with the goal of EMF reduction, the HPP interconnection will be generally designed and constructed using the principles outlined in the PG&E publication, *Transmission Line EMF Guidelines*. These guidelines incorporate the directives of the CPUC by developing design procedures that comply with Decision 93-11-013 and GO-95, 128, and 131-D. In other words when the towers, conductors, and rights-of-way are designed and routed according to the PG&E guidelines, the transmission line is consistent with the CPUC mandate.

From the PG&E guidelines, the primary techniques for reducing EMF anywhere along the line are the following:

- Increase the distance from the line conductors
- Reduce the spacing between the line conductors
- Minimize the current on the line
- Optimize the configuration of the phases (A, B, C)

The HPP Generator Tie-line will be located entirely on the HPP site or the existing PG&E Henrietta Substation site, thereby avoiding proximity to residential and public-use areas. The nearest residence is over a mile away.

6.2.4.2 Conclusion on Electromagnetic Fields

EMF reduction will be an integral consideration during the design and routing of the interconnection between the HPP and the offsite switchyard. Since the PG&E *Transmission Line EMF Guidelines* embody the CPUC directives for EMF reduction, the guidelines are the primary criteria for EMF considerations in this project.

The route of the proposed transmission line is not near any areas of public concern, including schools and daycare centers. Mitigative measures, such as locating the line away from sensitive facilities or increasing the aboveground height of the conductor when a sensitive facility is close to the edge of the right-of-way, will not be required.

6.2.5 Induced Current and Voltages

A conducting object, such as a vehicle or person, in an electric field will experience induced-voltages and currents. The magnitude of the induced current will depend upon the electric field strength, the size and shape of the object, and object-to-ground resistance. The measured induced current for a person in a 1-kV/m electric field is 0.016 milliamps (mA); for a large school bus, 0.41 mA; and for a large trailer truck, 0.63 mA.

When a conducting object in an electric field is isolated from ground, and a grounded person touches the object, a perceptible current or shock may occur. The magnitude of

the current depends upon the field strength, the size (or length for fences, pipelines, and railroad tracks) of the object and the grounding resistance of the object and person. Shocks are classified as below perception, above perception, secondary, and primary. The mean perception level is 1.0 mA for a 180-pound man and 0.7 mA for a 120-pound woman. Secondary shocks cause no direct physiological harm but may annoy a person and cause involuntary muscle contraction. The lower average secondary-shock level for an average-sized man is about 2 mA. Primary shocks can be harmful; their lower level is described as the current at which 99.5 percent of subjects can still voluntarily “let go” of the shocking electrode. For the 180-pound man this is 9 mA, for the 120-pound woman, 6 mA, and for children, 5 mA.

The NESC specifies 5 mA as the maximum allowable short-circuit current to ground from vehicles, trucks, and equipment near transmission lines.

The mitigation for hazardous and nuisance shocks is to ensure that metallic objects on or near the right-of-way are grounded, and that sufficient clearances are provided at roadways and parking lots to keep electric-field-induced-voltages sufficiently low (below 5 mA) to prevent vehicle short-circuit currents resulting from vehicle contact by persons.

Magnetic fields can also induce voltages and currents in conducting objects. Typically, this requires a long metallic object such as a fence, pipeline, or railroad that is grounded at only one location. A person who touches the object, at a location remote from the grounded point, will experience a shock similar to that described above for an ungrounded object. Installing multiple grounds on fences or pipelines parallel to the transmission line can mitigate this problem.

The proposed 70-kV transmission line will be constructed in conformance with GO-95 and Title 8 of the California Code of Regulations (CCR), Section 2700 requirements. Therefore, hazardous shocks are unlikely to occur as a result of the HPP construction or operation.

6.2.6 Nuisance Shocks

Normal grounding practices effectively mitigate the possibility of nuisance shocks resulting from induced currents from stationary objects near the line, such as fences and

buildings. Since the electric field extends beyond the right-of-way, grounding requirements extend beyond the right-of-way for very large metal objects or very long fences. Electric fences require a special grounding technique because they can operate only if they are insulated. Application of the grounding policy during and after construction will effectively mitigate the potential for shocks from stationary objects near the proposed line.

6.2.7 Fire Hazards

The transmission line and switchyards will be constructed in conformance with CPUC GO-95 and NESC standards. Title 14 CCR, Section 1250, Article 4 (from CPUC GO-95) establishes fire prevention standards for electric utilities. The HPP will comply with these standards.

6.2.8 Cumulative Impacts

This proposed transmission line will operate near existing transmission lines along the right-of-way. Interaction with the electric and magnetic fields of other existing lines will depend on the phase arrangements and relative positions of the conductors of the new line compared to the existing lines. Based on the short length of the HPP Generator Tie-line and its distance from surrounding transmission lines, any cumulative effect with respect to electric and magnetic fields is expected to be negligible. Corona noise for the proposed line is projected to be small and is not expected to significantly increase the ambient noise near the existing lines.

6.3 Transmission System Evaluation

6.3.1 PG&E Facilities Cost Report Study

GWF Energy LLC requested that PG&E prepare a Facilities Cost Report Study for the electrical interconnection of the proposed HPP. The final study is provided in Appendix A. The study evaluated the potential impacts of adding 95.8 MW (at 0.85 power factor) of generation to the PG&E system. PG&E evaluated the existing transmission system and determined that it is adequate to accommodate the output of the HPP.

6.4 Proposed Conditions of Certification

Conditions of certification are proposed to ensure that the HPP will comply with all applicable LORS and will not result in significant transmission line safety and nuisance impacts. These conditions of certification are included in Appendix K.

6.5 Jurisdiction

Table 6-7 identifies agencies with jurisdiction to issue permits and approvals, and/or enforce laws and regulations.

6.6 Agency Contacts

Local contacts for the HPP Generator Tie-line and the HPP switchyard are shown in Table 6-8.

TABLES

Table 6-1
Design and Construction LORS

LORS	Applicability	AFC Conformance Section
GO-95 CPUC, Rules for Overhead Electric Line Construction	CPUC rule covers required clearances, grounding techniques, and maintenance and inspection requirements.	Section 6.1.2.2 Section 6.1.2.3
8 CCR, Section 2700 et seq. High Voltage Electrical Safety Orders	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation and equipment to provide practical safety and freedom from danger.	Section 6.1.2
GO-128 CPUC, Rules for Construction of Underground Electric Supply and Communications Systems	Establishes requirements and minimum standards to be used for the station AC power and communications circuits.	Section 6.1.2.1 Section 6.1.2.3
GO-52 CPUC, Construction and Operation of Power and Communications Line	Applies to the design of facilities to prevent or mitigate inductive interference.	Section 6.1.2.2 Section 6.1.2.3
ANSI/IEEE 693, IEEE Recommended Practices for Seismic Design of Substations	Provides recommended seismic design and construction practices.	Section 6.1.2.1 Section 6.1.2.2
IEEE 1119, IEEE Guide for Fence Safety Clearances in Electric-Supply Stations	Provides recommended clearance practices for Substation fences.	Section 6.1.2.1 Section 6.1.2.3
ANSI/IEEE 605, IEEE Guide for Design of Substation Rigid Bus Structures	Provides recommended design and construction practices for Substation rigid bus systems.	Section 6.1.2.1 Section 6.1.2.3
NFPA 70-1996, National Electrical Code	Establishes requirements and minimum standards for low-voltage AC systems.	Section 6.1.2

**Table 6-2
Fire Hazard LORS**

LORS	Applicability	AFC Conformance Section
Title 14 CCR, Sections 1250–1258, Fire Prevention Standards for Electric Utilities	Provides specific exemptions from electric pole and tower firebreak and electric conductor clearance standards, and specifies when and where standards apply.	Section 6.1.2.2 Section 6.1.2.3
ANSI/IEEE 979, IEEE Guide for Substation Fire Protection	Provides guidance for fire protection practices that should be used in designing control and relay buildings.	Section 6.1.2.1 Section 6.1.2.3
GO-95 CPUC, Rules for Overhead Electric Line Construction, Section 35	CPUC rule covers tree trimming criteria to mitigate fire hazard.	Section 6.1.2.2 Section 6.1.2.3

**Table 6-3
Hazardous Shock LORS**

LORS	Applicability	AFC Conformance Section
Title 8 CCR, Section 2700 et seq. High Voltage Electrical Safety Orders	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical equipment to provide practical safety and freedom from danger.	Section 6.1.2
ANSI/IEEE 80, IEEE Guide for Safety in AC Substation Grounding	Presents guidelines for assuring safety through proper grounding in AC outdoor Substations.	Section 6.1.2.1 Section 6.1.2.3
NESC, ANSI C2, Section 9 Article 92, Paragraph E Article 93, Paragraph C	Covers grounding methods for electrical supply and communications facilities.	Section 6.1.2.1 Section 6.1.2.3

**Table 6-4
Aviation Safety LORS**

LORS	Applicability	AFC Conformance Section
Title 14 CFR, Part 77, Objects Affecting Navigable Airspace	Describes the criteria used to determine whether a Notice of Proposed Construction or Alteration (NPCA, FAA Form 7460-1) is required for potential obstruction hazards.	Section 6.2.2
FAA Advisory Circular No. 70/7460-1G, Obstruction Marking and Lighting	Describes the FAA standards for marking and lighting of obstructions as identified by Federal Aviation Regulations, Part 77.	Section 6.2.2
FAA Advisory Circular No. 70/7460-2H, Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace	Informs individuals proposing to erect or alter an object that may affect the navigable airspace of the need to notify the FAA prior to such construction.	Section 6.2.2
Public Utilities Code, Sections 21656–21660	Discusses the permit requirement for construction of possible obstructions in the vicinity of aircraft landing areas, to navigable airspace, and near the boundary of airports.	Section 6.2.2

**Table 6-5
Communication Interference LORS**

LORS	Applicability	AFC Conformance Section
Title 47 CFR, Section 15.25, Operating Requirements, Incidental Radiation	Prohibits operations of any device emitting incidental radiation that causes interference to communications. The regulation also requires mitigation for any device that causes interference.	Section 6.2.3
GO-52, CPUC	Governs the Construction and Operation of Power and Communications Lines and specifically applies to the prevention or mitigation of inductive interference.	Section 6.2.3 Section 6.2.4
CEC staff, RI-TVI Criteria (Kern River Cogeneration Project 82-AFC-2, Final Decision, Compliance Plan 13-7)	Prescribes the CEC's RI/TVI mitigation requirements, developed and adopted by the CEC in past siting cases.	Section 6.2.3

Table 6-6
State Regulatory Requirements on Electric and Magnetic Fields

	Electric Field		Magnetic Row
	On ROW	Edge of ROW	Edge of ROW
Florida	8-kV/m ¹	2-kV/m	150 mG ¹ (max load)
	10-kV/m ²	--	200 mG ² (max load)
	--	--	250 mG ³ (max load)
Minnesota	8-kV/m	--	--
Montana	7-kV/m ⁴	1-kV/m	
New Jersey	--	3-kV/m	--
New York	11.8-kV/m	1.6-kV/m	200 mG (max load)
	11.0-kV/m ⁵	--	
	7-kV/m ⁴	--	
North Dakota	9-kV/m ⁶	--	--
Oregon	9-kV/m ⁷	--	--
Rhode Island	8-kV/m ⁸	--	--

¹For lines of 69-kV-70-kV

²For 500-kV lines

³For double-circuit 500-kV lines

⁴Maximum for highway crossings

⁵Maximum for private road crossings

⁶For 70-kV lines and above

⁷For 70-kV lines and above

⁸For all new lines

**Table 6-7
Jurisdiction**

Agency or Jurisdiction	Responsibility
<p>CEC Project Manager 1516 9th Street, MS-15 Sacramento, CA 95814-5512</p>	<p>Jurisdiction over new transmission lines associated with thermal power plants that are 50 MW or more (PRC 25500); jurisdiction of lines out of a thermal power plant to the interconnection point to the utility grid (PRC 25107); jurisdiction over modifications of existing facilities that increase peak operating-voltage or peak kilowatt capacity by 25 percent (PRC 25123).</p>
<p>CPUC Mr. Julian Ajello Supervisor, North California Safety Section 505 Van Ness Avenue San Francisco, CA 94102 (415) 703-1327</p>	<p>Regulates construction and operation of overhead transmission lines (GO-95); regulates construction and operation of underground transmission and distribution lines (GO-128); regulates construction and operation of power and communications lines for the prevention of inductive interference (GO-52).</p>
<p>Kings County Electrical Inspector 1400 West Lacey Hanford, CA 93230 (559) 582-3211</p>	<p>Jurisdiction over safety inspection of electrical installations that connect to the supply of electricity (NFPA 70).</p>
<p>Western Systems Coordinating Council Mr. Dennis E. Eyre Executive Director 615 Arapeen Drive, Suite 210 Salt Lake City, UT 84108 (801) 582-0353</p>	<p>Establishes power supply design criteria to improve reliability of the power system.</p>

Table 6-8
Agency and Utility Contacts

Agency	Contact/Title	Telephone Number
California Independent System Operator 151 Blue Ravine Road Folsom, CA 95630	Armando Perez Director, Grid Planning	(916) 331-4444
PG&E Transmission Projects 406 Higuera St. San Luis Obispo, CA 93401	John Hagen Project Manager	(805) 595-6356
CPUC 505 Van Ness Avenue San Francisco, CA 94102	Julian Ajello Supervisor, North California Safety Section	(415) 703-1327
Kings County Electrical Inspector 1400 West Lacey Hanford, CA 93230	Gerry Showers Building Maintenance Superintendent	(559) 582-3211
Western Systems Coordinating Council 615 Arapeen Drive, Suite 210 Salt Lake City, UT 84108	Dennis E. Eyre Executive Director	(801) 582-0353

FIGURES